

**U.S. Department of the Interior  
Bureau of Land Management**

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**Environmental Assessment  
DOI-BLM-NV-S010-2012-0080-EA  
September 2012**

Comment [AMH1]: LM to fill in blanks

**Muddy River Fish Barrier Project**

**GENERAL LOCATION**

The proposed project area is generally located on the Muddy River, near  
Glendale, Nevada

**U.S. Bureau of Land Management  
Southern Nevada District Office  
Las Vegas Field Office  
4701 North Torrey Pines Drive  
Las Vegas, Nevada 89130**



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## 1.0 BACKGROUND INFORMATION

### 1.1 Introduction

The Muddy River provides habitat for a unique array of rare species. Conservation of the Muddy River species is a high priority for local, state, and federal agencies. The Muddy River is home to one native species of fish listed as endangered—the Moapa dace (*Moapa coriacea*). In addition, there are two other State sensitive and U.S. Bureau of Land Management (BLM) special-status fish species known to occur in the area: Virgin River Chub (*Gila seminuda*) and Moapa speckled dace (*Rhinichthys osculus moapae*). Populations of Moapa dace have been declining since the species was placed on the Endangered Species List in 1967. These fish populations are currently under threat from the upstream invasion of non-native fish, principally the blue tilapia (*Oreochromis aurea*).

To combat the decline of these endangered and sensitive species, the BLM proposes to construct two concrete fish barriers (Hidden Valley and the Narrows) on the Muddy River (the Proposed Action), near the towns of Moapa and Glendale, Nevada (Figure 1). Combined with the existing upstream barrier located within the Moapa Valley Wildlife Refuge (Refuge barrier) and a water diversion on Tribal land (Wells Siding Diversion), these barriers are intended to stop movement of unwanted, non-native fish into habitat of endangered and sensitive species, including the Moapa dace. Fish barriers play a central role in the reestablishment of native fish populations by preventing the current and future upstream migration of invasive, non-native fishes. Once the barriers are constructed, non-native fish can be eradicated from the river upstream of the barrier and the native populations can be reintroduced to the river. The barriers then prevent future invasion of non-native species, allowing the native fish populations to rebound. Multiple barriers also provide insurance against invasion should any one of them fail, perhaps during flooding, and results in a tradeoff between impeding the upstream dispersal of native aquatic species in the upper river and preventing further invasions of tilapia.

This project has been approved for funding through the Southern Nevada Public Lands Management Act, Round 5. The Bureau of Reclamation is collaborating with the BLM to provide the project design and engineering. This environmental assessment (EA) is required to fully satisfy the National Environmental Policy Act (NEPA) of 1970, as amended (42 United States Code [USC] 4321 *et seq.*), which requires the lead federal agency to evaluate and publicly disclose the environmental effects of their federal undertaking.

The project area (Hidden Valley and Narrows Fish Barriers) would be situated entirely on land administered by the BLM. The proposed fish barriers and subsequent impoundments would be located in the following portions of Clark County, Nevada, on the U.S. Geological Survey (USGS) Moapa East 7.5-minute quadrangle:

Hidden Valley: Township 15 South, Range 66 East, Section 4

The Narrows: Township 15 South, Range 67 East, Section 17

### 1.2 Purpose and Need

The purpose of the Proposed Action is to prevent the continued spread of non-native fishes up the Muddy River, thereby decreasing the predation and competitive pressure imposed by introduced fishes on the endangered Moapa dace and other sensitive fish species. The Proposed Action would also facilitate the future eradication of non-native fishes and would eventually restore genetic connectivity to native fish populations. There is also a need to comply with the Muddy River Recovery Implementation Program.

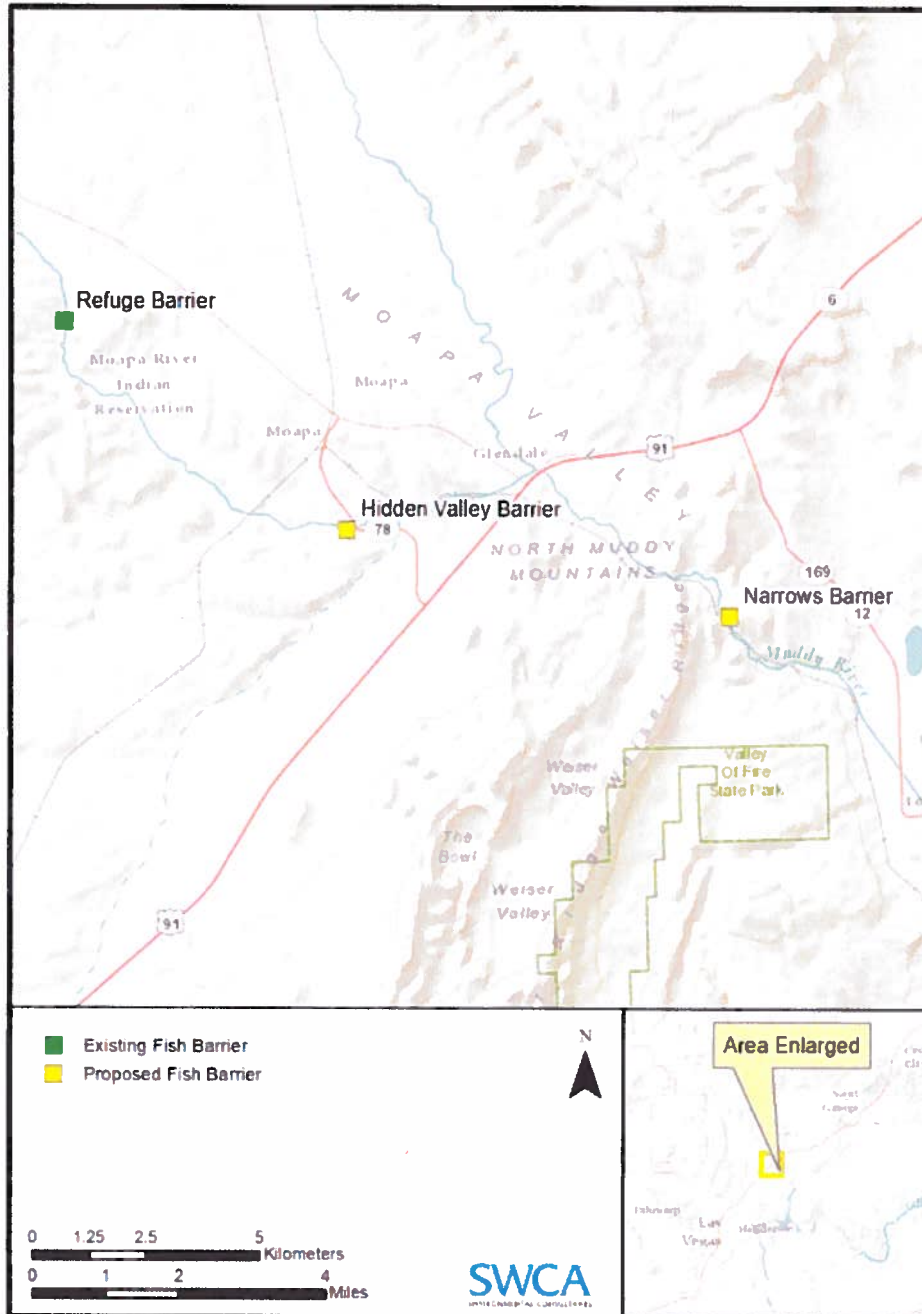


Figure 1. Project area location.

The program is a coordinated, multi-agency effort to protect the species and habitat of the Muddy River, while ensuring the responsible management of water resources in the Muddy River and Coyote Spring Valley.

### **1.3 Conformance with Applicable Land Use Plans**

The Federal Land Policy and Management Act (FLPMA) of 1976, as amended, establishes the principle of multiple-use management for the BLM. The current BLM Las Vegas Resource Management Plan (LVRMP) is consistent with FLPMA and guides the decisions for the BLM to protect and manage wildlife, including threatened and endangered species (BLM 1998a). The Proposed Action is in conformance with the LVRMP Record of Decision (BLM 1998b) objectives, that the BLM “re-establish native fauna to historic habitat and improve population numbers in current use areas” (FW-2), as well as “support viable and diverse native wildlife populations by providing and maintaining sufficient...cover and space to satisfy needs of wildlife species using habitats on public land” (FW-3).

## **2.0 PROPOSED ACTION AND ALTERNATIVES**

### **2.1 Proposed Action**

Under the Proposed Action, two concrete fish barriers would be constructed within the Muddy River in order to inhibit the upstream movement of non-native fishes. To be located in an area known as Moapa Valley (see Figure 1), these fish barriers would be the lowest barriers on the Muddy River. As such, they would function as the “anchor” barriers. The upstream barrier would be constructed in Hidden Valley and the downstream barrier would be constructed in the Narrows. In these particular areas, the river valley consists of a moderately incised channel (Figures 2 and 3) with some areas that are extremely incised (Figure 4). The river channel is about 60 feet wide, with a maximum elevation change of about 15 feet. Under normal conditions, the open water in the main river channel measures between 7 and 12 feet across and meanders back and forth across the Muddy River valley floor. The average depth of the river is 2 to 5 feet, and the ordinary high water mark (OHWM) is approximately 3 feet above the current water level. The OHWM is defined as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (U.S. Army Corps of Engineers [USACE] 2005).

The barriers would prevent upstream fish passage by creating a vertical discontinuity in the stream surface that the fish are unable to jump over, or by increasing the stream velocity above the maximum swim speed of the fish. Given the range of flows that have been recorded on the Muddy River, this fish barrier would perform both functions. At low flows, the barrier would create a vertical discontinuity in the stream surface that the fish would not be able to jump over.

At high flows, the barrier would be partially submerged and the vertical discontinuity would not develop, but the stream velocity would be above the highest swim speed of the fish. As the water drops over the barrier, the water would accelerate due to gravity. The water would first begin to accelerate slightly upstream of the barrier, reach its maximum velocity at the bottom of the barrier, and then decelerate after it leaves the barrier. At intermediate flows, the barrier would produce both a vertical discontinuity and high stream velocities that would combine to prevent fish passage.



**Figure 2.** Proposed fish barrier location at the Hidden Valley site.



**Figure 3.** Proposed fish barrier location at the Narrows site.





**Figure 4.** Incised channel at the Hidden Valley site.

The BLM provided the Bureau of Reclamation with the basic design requirement that the barriers create a minimum 4-foot-tall vertical jump in the stream surface. This distance became the design basis for the rest of the barrier. No stream velocity requirements were given.

### **2.1.1 Fish Barrier Description**

#### **FISH BARRIER CONSTRUCTION**

##### **Hidden Valley**

The fish barrier would consist of a 20-foot-wide overflow structure flanked by 15-foot wing walls. The height of the structure would be 4 feet tall with 1 foot of riprap beneath it. The overflow crest would be set at 1,548 feet above mean sea level (amsl). The wing walls would rise 5 feet above the crest of the structure. The height of the wing walls above the existing ground surface would range from approximately 0 to 4 feet, depending on the height of the structure and the elevation of the ground surface. The footings and wing walls would be buried between 2 and 12 feet below the existing ground surface. Figure 5 shows the proposed Hidden Valley fish barrier.

The overflow structure would be composed of a concrete wall with an upstream and downstream concrete apron. The wing walls would consist of an approximately 1-foot-thick reinforced concrete retaining wall. The wall footings would be buried approximately 2 feet below the ground surface. An estimated 36 cubic yards (cy) of concrete would be required to construct the fish barrier: 20 cy in wall footings, and 16 cy in the walls. Riprap would be used to protect the channel and abutments from erosion along the apron edges at the ends of the overflow structure. Riprap would be placed from the bottom of the channel to 2 feet above water level and would extend 3 feet upstream and 30 feet downstream from the fish barrier on both sides of the river.



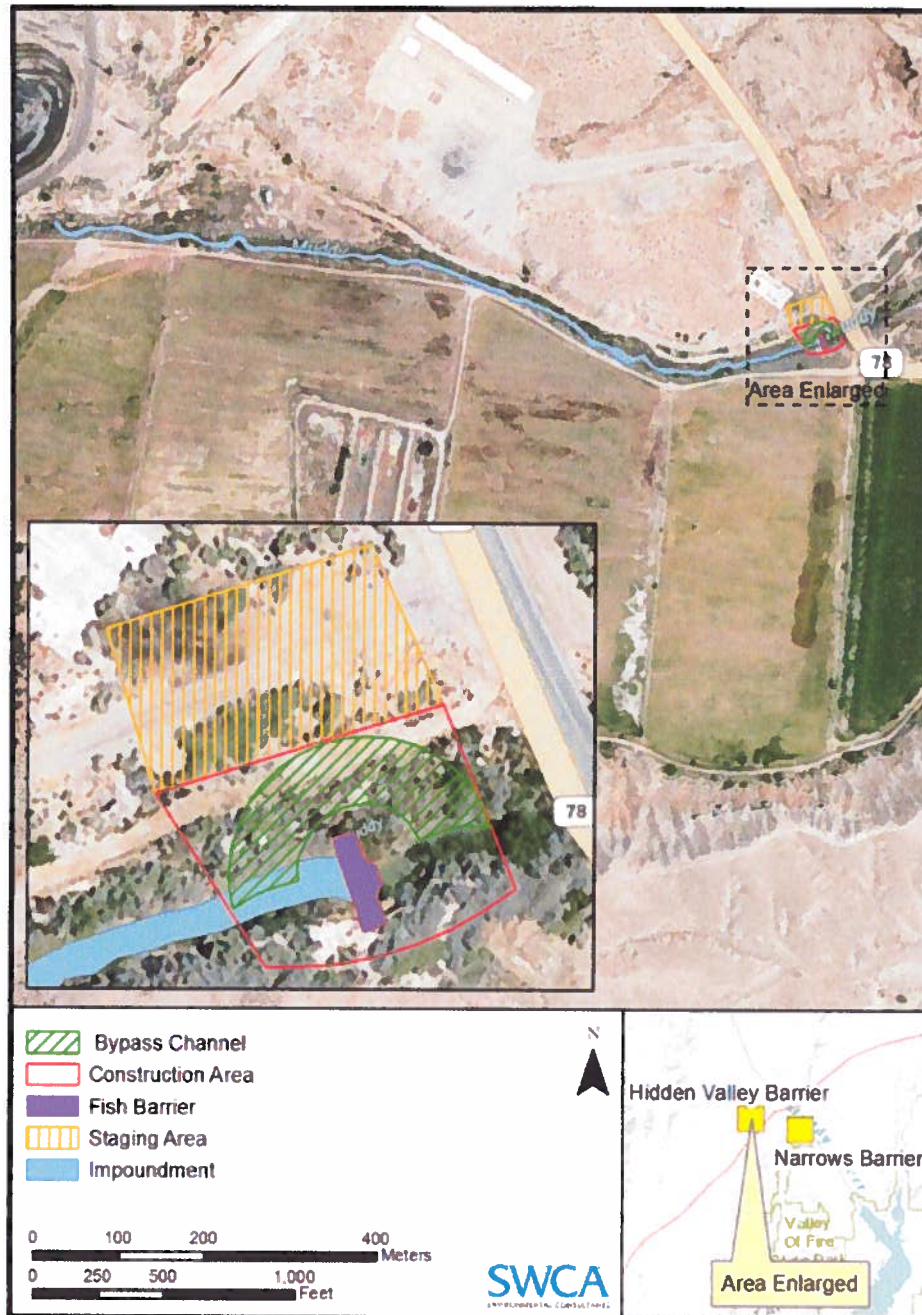


Figure 5. Proposed fish barrier at Hidden Valley.

Approximately 0.25 acre downstream of the fish barrier would be excavated in order to construct the barrier. The required excavations would be below the level of the river and would require that the groundwater be removed from the excavations in order to construct the barrier. Groundwater would be removed by embedding submersible pumps in a layer of gravel (up to 3 feet thick) placed in the bottom of the excavation. After removal from the excavation, if water is discharged at a rate of 50 gallons per minute or less, it would be returned directly back to the river. If water is discharged at a rate of more than 50 gallons per minute, it would be pumped to an unlined infiltration pond located either within the downstream excavation area or within the area of inundation where it would seep back into the ground and/or evaporate. Water discharge into the river is regulated by the Nevada Division of Environmental Protection (NDEP), and all necessary NDEP permits would be obtained prior to construction. Construction of the barrier would create an impoundment upstream of the barrier. The overflow crest would be contained within the OHWM, and therefore at typical flows (up to 34 cubic feet per second [cfs]), the impoundment depth would remain within the existing OHWM and would extend approximately 3,000 feet upstream of the barrier (see Figure 5).

#### **The Narrows**

The Narrows barrier would be constructed in the same manner as the Hidden Valley barrier. The Narrows fish barrier would be slightly wider than the Hidden Valley barrier and would consist of a 20-foot-wide overflow structure flanked by 24-foot wing walls. The height of the structure would be the same as the Hidden Valley barrier. An estimated 50 cy of concrete would be required to construct the Narrows fish barrier: 28 cy in wall footings and aprons, and 22 cy in the walls. All other construction activities would be the same as the Hidden Valley fish barrier. Figure 6 shows the proposed fish barrier at the Narrows.

### **SITE ACCESS AND CONSTRUCTION STAGING**

#### **Hidden Valley**

The proposed fish barrier location is adjacent to an existing road. No new access roads would be required. A previously disturbed area on the north side of the river would be used for construction and equipment staging (see Figure 5). Clearing of vegetation would be required for construction and equipment staging. Approximately 0.3 acre of short-term disturbance would occur as a result of equipment staging and 0.4 acre would be disturbed in the short term for construction of the fish barrier (see Figure 5; Table 1).

#### **The Narrows**

An existing two-track road on BLM-managed land that is adjacent to a fence delineating private property would be used to access this site. The existing road is adequate for construction access, so no new access roads would be required; however, some road grading may be required within the current area of disturbance. Clearing of vegetation would be required for construction and equipment staging. Approximately 0.1 acre of short-term surface disturbance would occur as a result for equipment staging and 0.3 acre would be disturbed in the short term for construction of the fish barrier (see Figure 6; see Table 1).

### **RIVER CONTROL**

#### **Hidden Valley**

The river must be carefully routed and controlled during construction of the barrier to provide safe working conditions and prevent disruption of construction or damage to the structure. Temporary 6-foot-high coffer dams would be placed upstream and downstream of the barrier and the river would be diverted through a temporary excavated bypass channel. The width of the bypass channel would be 10 feet at the bottom of the channel and 40 feet at the top with a 1:1 slope on each side. Approximately

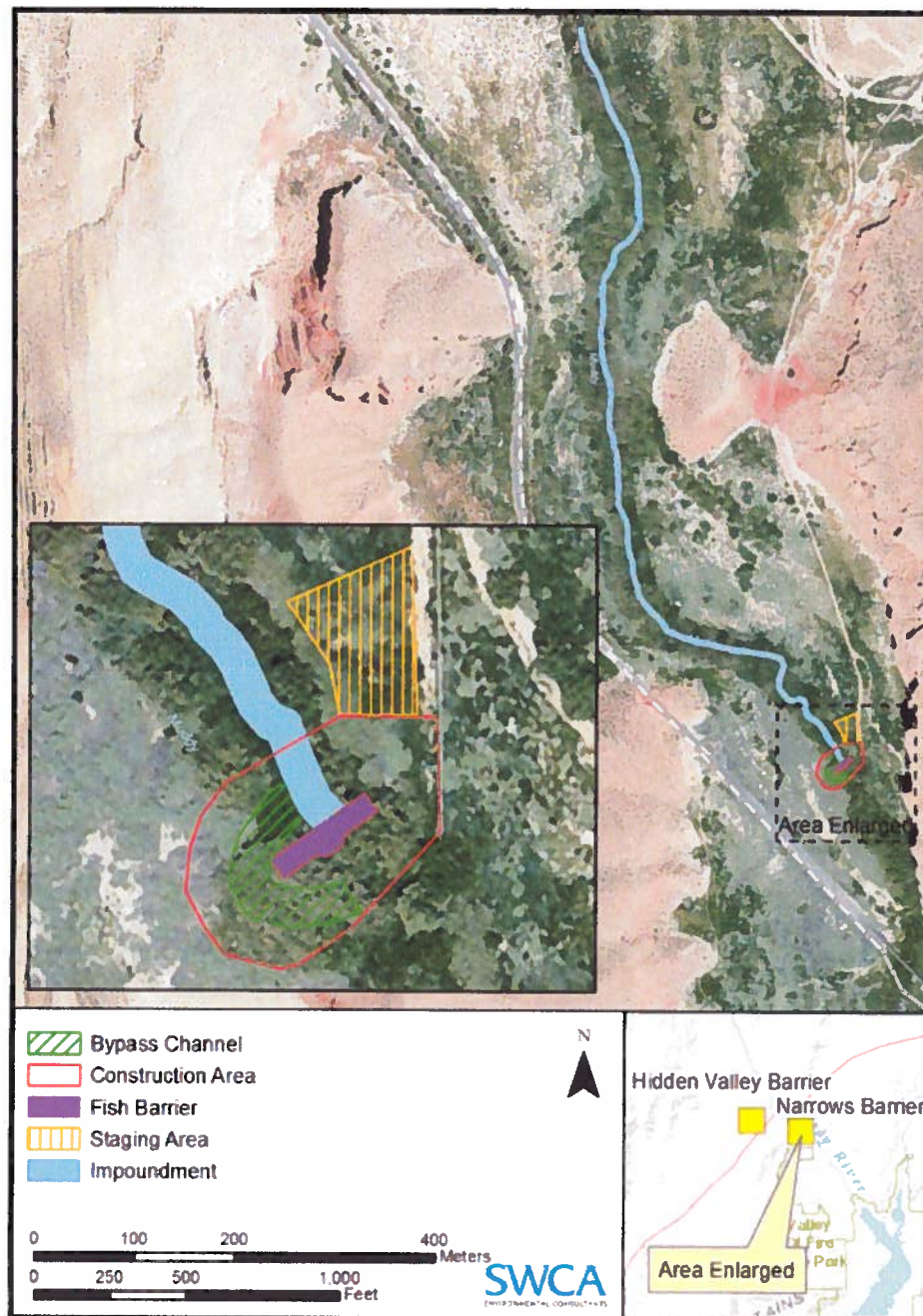


Figure 6. Proposed fish barrier at the Narrows.

2,100 cy of soil would be excavated for the bypass channel and stored in the staging area during construction of the fish barrier. The river would be diverted for approximately 3 weeks. The bypass channel would be filled in with the original excavated material once the barrier is complete. Figure 5 shows the proposed location of the bypass channel at Hidden Valley.

### **The Narrows**

A bypass channel similar to what is described for Hidden Valley would be used at the Narrows; however, the width of the bypass channel would be 36 feet at the top and approximately 1,800 cy of soil would be excavated and stored in the staging area during construction of the fish barrier. Figure 6 shows the proposed location of the bypass channel at the Narrows.

**Table 1. Surface Disturbance Associated with Project Activities**

<b>Fish Barrier Location</b>	<b>Activity</b>	<b>Surface Disturbance (acres)</b>	<b>Disturbance Type</b>
Hidden Valley	Fish barrier construction area*	0.37	Temporary
	Fish barrier	0.02	Permanent
	Riprap	0.02	Permanent
	Staging area	0.33	Temporary
	Access road construction	0	N/A
The Narrows	Fish barrier construction area*	0.34	Temporary
	Fish barrier	0.02	Permanent
	Riprap	0.02	Permanent
	Staging area	0.12	Temporary
	Access road construction	0	N/A

\* Includes temporary construction area and bypass channel.

### **CONSTRUCTION TIMING AND DURATION**

Construction of both barriers would occur when stream flows are generally lowest and as access is available. Construction would not occur when stream flows increase beyond the contractor's capacity to safety control the river. The contractor would suspend activities at the work site during the period of high flows, returning again when stream flows normally decrease to safe levels again.

### **CONTRACTOR USE AREAS AND CONSTRUCTION EQUIPMENT**

Heavy machinery required for construction would likely include excavators, front-end loaders, bulldozers, skid steers, crawler-mounted cranes, concrete trucks, semi-trucks, water trucks, water tree (for filling water truck), compactors, generators, water pumps, and light plants. Construction equipment and materials would be stored adjacent to the river in designated staging areas (see Figures 5 and 6).

Vehicles entering the project area would include concrete trucks, large semi-trucks delivering construction materials and equipment, and small pickup and utility trucks. During hot weather, concreting would take place during the night and early morning hours, so construction traffic could occur at any time during the day. On any given day, construction traffic could consist of up to three concrete trucks, two semi-trucks, and three small vehicles.



### **2.1.2 Treatment of Non-Native Fish**

Once the proposed fish barriers become operational, chemical removal of non-native fish populations would be performed within three specified reaches of the Muddy River: 1) from the Moapa Band of Paiutes fish barrier to the Wells Siding Diversion; 2) from the Wells Siding Diversion to the proposed Hidden Valley fish barrier; and 3) from the proposed Hidden Valley fish barrier to the proposed Narrows fish barrier. This effort would involve the coordination of multiple agencies including the Nevada Department of Wildlife (NDOW), U.S. Fish and Wildlife Service (USFWS), and NDEP. This component of the Proposed Action would consist of four stages: native fish salvage, chemical treatment, detoxification, and post-treatment monitoring. The following sections describe the various stages of non-native fish removal.

#### **NATIVE FISH SALVAGE**

Specific salvage efforts would be determined through pretreatment sampling and would be based on conditions and fish populations present, along with discussions with project partners as to the disposition of salvaged fish. Surveys would be done to determine the number of natives present in each segment. Depending on the number of natives, it could be an option to salvage a number of them and return them back to that segment after detoxification. Capture methods during salvage would be consistent with previous Muddy River fish sampling efforts (Shattuck et al. 2012) and would adhere to protection measures described in Section 2.1.4. Those measures include procedures for minimizing handling stress and incidental take of native fish species, and would be implemented during salvage. Any mortality of a State- or BLM-sensitive fish would be documented, preserved, and reported to the NDOW and the BLM. Following treatment, any salvaged fish held off-site would be returned to the wild or placed in designated hatcheries.

#### **CHEMICAL TREATMENT**

The application of the chemical CFT Legumine rotenone is the proposed method for removal of invasive fish species from the South Fork of the Muddy River. Treatment would occur within three separate reaches of the Muddy River: from the Moapa Band of Paiutes fish barrier to the Wells Siding Diversion; from the Wells Siding Diversion to the proposed Hidden Valley fish barrier; and from the proposed Hidden Valley fish barrier to the proposed Narrows fish barrier. There would be four 6-hour treatments for each river segment. Each treatment would occur approximately 1 week apart. Flowing water areas would be treated at 4 parts per million (ppm). Standing water areas would be pump injected from a 65-gallon tank at 4 ppm, and treated with backpack sprayers at standard v/v 10% solution. Live tilapia and/or mollies (*Poecilia* spp.) would be placed in cages at appropriate points in the system for bioassay monitoring to determine the effectiveness of the treatment.

Freshwater seeps that flow into the river would be treated with a powdered rotenone/sand mixture placed in burlap bags, and set directly onto the inflowing seeps at the start of each treatment. The ratio of the mixture is one part powdered rotenone (cube root powder), one part sand, and 0.1 ounce of unflavored gelatin and enough water to cause the rotenone to adhere to the sand. The concentration of the rotenone/sand mixture would be approximately 0.2–0.5 ppm. The purpose of this treatment is to isolate small-volume freshwater inflows and prevent invasive fish, specifically tilapia, from retreating into these seeps to escape the toxicant.

Once application of the rotenone begins, a field crew would extensively survey the treated area for surviving native fish and collect fish mortalities. Fish mortalities would be enumerated. A majority of the fish mortalities would be removed when feasible. However, not all small-bodied mortalities can be removed because of the large size of the treatment area, and the channel structure/dense riparian vegetation in some locations which will not allow access. Because rotenone is non-toxic to humans,

domestic animals, and terrestrial wildlife, and the total biomass of mortalities would be very small and dispersed along the treatment area, it is not anticipated that any human health issues, odors, or aesthetic concerns will result from this approach (Marking 1988). Any fish mortalities collected will be disposed of by burying using standardized handling protocols. Native fish mortalities shall be distributed to educational institutions or buried.

Application of toxicant will be conducted by NDOW personnel certified for aquatic pesticide application by the Nevada Department of Agriculture or by personnel under their direct supervision. This activity will be conducted with cooperative assistance from the USFWS and the Southern Nevada Water Authority, and will adhere to environmental protection measures described in Section 2.1.4.

#### **DETOXIFICATION**

Rotenone breaks down quickly with warm water temperatures and in alkaline water, conditions typically met in the system. However, to further prevent loss of native fish downstream in the main stem of the Muddy River detoxification will be completed. As an extra precaution against accidental drift of rotenone outside of the target reaches, potassium permanganate (KMnO<sub>4</sub>) stock solution would be applied at a rate sufficient to detoxify double the target rotenone concentration (6.0 ppm) throughout the treatment (i.e., twice the expected instream concentration).[EK2] Detoxification would commence X [AMH3]days[dsd4] after treatment and would continue until all rotenone has passed through the treatment reach.

#### **POST-TREATMENT MONITORING**

Post-treatment monitoring determines the effectiveness of the treatment on the non-native species as well as the amount of recolonization of the native species. Post-treatment monitoring would be conducted using fish traps and snorkeling surveys. Post-treatment sampling would begin the week after each treatment has been completed. Additional post-treatment monitoring would occur after the initial weeks to determine either the need for additional treatment efforts or to monitor native fish reestablishment.

#### **2.1.3 Barrier Removal**

Currently, one fish barrier and one water diversion exist upstream of the proposed fish barriers (see Figure 1). Once non-native fish are treated as described above, the goal is to reconnect the river upstream of the Narrows to allow for increased genetic flow. The existing Refuge barrier and the proposed Hidden Valley barrier have been engineered to include "center cores" that can be removed, resulting in reestablishment of normal water flow. The barrier cores would be removed when annual monitoring results indicate that native fish populations have been restored and non-native fish populations have been eradicated in these segments of the Muddy River (approximately 5 to 10 years).

#### **2.1.4 Environmental Protection Measures**

Under the Proposed Action, the BLM would implement the environmental protection measures described below to minimize adverse impacts to project area resources.

1. All relevant permits from the State of Nevada and Clark County will be obtained prior to construction.
2. A Worker Environmental Awareness Program will be implemented for construction crews prior to the commencement of groundbreaking/excavation activities. Training materials and briefings will include, but not be limited to, discussion of the federal Endangered Species Act, the consequences of noncompliance with this act, identification and values of wildlife and natural plant communities, hazardous substance spill prevention and containment measures, and review of all required and recommended conservation measures.

3. During construction of the fish barrier, the best management practices (BMPs) prescribed by the NDEP Bureau of Water Quality Planning will be employed in order to reduce such impacts as sediment deposition and erosion of river banks while working outside the river channel.
4. A Stormwater Pollution Prevention Plan (SWPPP) will be required prior to groundbreaking activities to address work within the Muddy River channel, as well as work outside the river channel that may result in sediment transport into the river. The SWPPP will also address requirements for both high- and low-flow conditions.
5. The contractor will implement a litter control program during construction activities that will include the use of covered, raven-proof trash receptacles, removal of trash from the construction site to the trash receptacles following the close of each work day, and proper disposal of trash in a designated solid waste disposal facility at the end of each work week. This effort will reduce the attractiveness of the area to opportunistic predators such as coyotes, kit foxes, and common ravens.
6. A maximum speed limit of 15 miles per hour will be maintained while traveling in areas of groundbreaking or excavation. This effort will reduce the potential for vehicle-wildlife collisions.
7. Any fuel or hazardous waste leaks or spills will be contained immediately and cleaned up at the time of occurrence. Contaminated soil will be removed and disposed of at an appropriate facility.
8. Appropriate dust control measures will be taken and BMPs will be followed during construction, including the regular spraying of a liquid dust suppressant on the surface of dirt, turn-around areas, and rights-of-way as approved by Clark County Department of Air Quality and Environmental Management.
9. Cacti and yucca species are protected under Nevada Revised Statutes (NRS) 527.060–527.120 and are required to be salvaged based on requirements stipulated by the BLM. Salvaged plants will be used for revegetation of the project area or other disturbed areas, or will be sent to a BLM stockpiling facility as directed by the BLM.
10. Topsoil will be salvaged and later redistributed in order to maintain seed-bearing soils. Topsoil should be suitably wetted and/or covered to reduce losses due to erosion and prevent contamination by non-native seeds.
11. Disturbed areas will be stabilized with appropriate treatments immediately following project facility construction until the areas can be revegetated, through seeding with BLM-approved site-specific mix(es) during the next appropriate planting period (i.e., spring or fall).
12. Equipment would be free of caked mud or debris prior to entering the project site to avoid the introduction of noxious weeds. Weed monitoring would occur for species identified by the State of Nevada, as well as for additional species specified by Clark County during a given year. Such species form the official list of weeds for which a county may apply for cost-share funding for control and removal efforts. Should such species be found during monitoring, control and eradication efforts would be implemented following Clark County control procedures.
13. Should previously unidentified cultural materials (artifacts, features, structures, human remains) be encountered during project activities, all operations in the immediate vicinity of the discovery will cease in order to protect the remains, and the BLM Authorized Officer (or representative) for the project will be notified immediately. The BLM Authorized Officer will have 48 hours from the time of acknowledgement of the report of an unanticipated discovery to arrange an on-site inspection with the project proponent and make a determination in consultation with the project proponent of measures to be taken to protect the discovery in place, recover the data, or allow the project to proceed.



14. Several procedures would be implemented during all sampling to minimize handling stress and mortality of native fish species. Pre-treatment sampling would only be conducted using seines to more easily capture fish grouped into deeper pools and to mitigate any stress caused by high temperatures. During identification and measuring, all fish would be held in the seine and submerged in water. If fish appear stressed they would be identified to species and standard age classes would be estimated (rather than the fish being measured) to ensure fish are returned to the river as quickly as possible. In addition, pulling the seine through habitat that is shallow and slow moving (i.e., slackwater) would be avoided during hot periods (approximately 88 degrees (°) Fahrenheit (F) [31° Celsius (C)] or higher) to reduce stress caused by higher temperatures and reduced oxygen levels present in these habitats. Snorkeling is also an option for monitoring fish when the river is running clear.
15. Rotenone and potassium permanganate would be stored at an authorized off-site location and transported to the treatment sites immediately prior to treatment. At the conclusion of treatment and detoxification, all excess rotenone and potassium permanganate would be returned immediately to the authorized location. In addition, all personnel involved would be provided safety equipment and fully briefed on safety issues.

## **2.2 No Action**

Under the No Action Alternative, the two new fish barriers would not be developed and chemical treatment of non-native fish species would not be completed within the three identified reaches of the Muddy River.

## **2.3 Alternatives Considered But Eliminated From Detailed Analysis**

### **2.3.1 Alternate barrier locations**

An alternate location approximately 3 miles upstream from the Narrows site was considered for construction of a fish barrier. Construction access to this site is very difficult and would make constructing the fish barrier technically infeasible; therefore this site was eliminated from consideration.

The BLM also evaluated a site adjacent to the Overton Wildlife Management Area. The site had numerous issues including an existing gauge station and was completely encumbered by private land. Therefore, this site was removed from consideration.

## **3.0 AFFECTED ENVIRONMENT**

### **3.1 Affected Resources**

Pursuant to BLM NEPA Handbook H-1790-1, Appendix 5, this EA must consider supplemental authorities as required by statute, executive order, or state guidelines (BLM 2008). Table 2 presents a list of all resources, including supplemental authorities, considered for analysis by BLM resource specialists. The affected environment for each site includes the proposed fish barrier location, and temporary construction and equipment staging areas. Except for water resources and wildlife, the impoundment area is not included in the affected environment because it would remain within the existing river channel OHWM.

**Table 2. Supplemental Authorities and Other Resources Evaluated for the Proposed Action**

Resource	Determination	Rationale
Air Quality	NI	A dust control permit would be obtained through the Department of Air Quality and Environmental Management (DAQEM) for all soil-disturbing activity of 0.25 acre or greater. Assuming the proponent complies with permit stipulations, there would be no impacts to air quality and no further evaluation is required.
Areas of Critical Environmental Concern	NP	The proposed project area is not within an Area of Critical Environmental Concern or designated critical habitat.
BLM Natural Areas	NP	There are no designated Natural Areas within the BLM Southern Nevada District.
Cultural Resources	NP	The BLM Las Vegas Field Office Archaeologist, Susanne Rowe, stated, "Due to extreme floodwater events and the extensive growth of tamarisk, the probability of finding intact cultural resources within the APE is negligible." Therefore, the BLM Archaeologist has determined that the undertaking as proposed is exempt from Section 106 review as specified in Section V.A.3(a) of the 2009 State Protocol Agreement with the Nevada State Historic Preservation Office (SHPO). No further evaluation is required.
Greenhouse Gas Emissions	NI	Currently there are no emission limits for suspected greenhouse gas (GHG) emissions and no technically defensible methodology for predicting potential climate change from GHG emissions. Although an increase in GHG emissions would occur as a result of construction activities, the increase would be minimal, and emissions would return to existing levels following construction.
Environmental Justice	NI	Any minority or low-income group present within the project area would not be disproportionately impacted by health or environmental effects.
Farmlands (prime and unique)	NP	No prime or unique farmlands occur in the project area.
Fish and Wildlife (excluding federally listed species)	PI	Wildlife in the general area consists of fish, small mammals, birds, and reptiles. Direct impacts of the Proposed Action would occur as a result of construction activities and the fish barrier. These impacts are analyzed in this EA.
Floodplains	PI	This project would impact the existing floodplains and would create new floodplains. These impacts are evaluated in detail within this EA.
Fuels/Fire Management	NI	Fire restrictions are generally enacted between May 15 and October 1. Compliance with fire restrictions is mandatory while fire restrictions are in place. Specific activities may be waived on a case-by-case basis by a line officer after review and approval by the Fire Management Officer.
Geology/Mineral Resources/Energy Production	NI	Due to the localized area of impact, it is anticipated that there would be no impacts to minerals and geology from the Proposed Action. There are mining claims at Section 17, Township 15 South, Range 67 East, and a courtesy letter will be sent to the claimant as the company has been active in exploration this year.
Hydrologic Conditions	PI	Impacts to hydrology from implementation of the Proposed Action are expected and are analyzed in detail in this EA.
Invasive Species/Noxious Weeds	PI	Implementation of the Proposed Action has the potential to disperse seed from the noxious and invasive plant species observed in the survey area during field surveys. Analysis of noxious and invasive plant species impacts is required and is presented in Section 4.4.1.3.
Lands/Access	NI	Current land uses in the project area would continue unaffected by the Proposed Action. There would be no change to existing access as a result of the Proposed Action.
Livestock Grazing	NI	The Hidden Valley site is not located in a grazing allotment. The Narrows site is within the Muddy River grazing allotment; however, as there are no authorized grazing permits within this allotment, the Proposed Action will have no impact on livestock grazing.
Migratory Birds	PI	Migratory birds may be present in the project area. Detailed analysis of migratory birds is required and is presented in Section 4.5.1.2.

**Table 2. Supplemental Authorities and Other Resources Evaluated for the Proposed Action (Continued)**

Resource	Determination	Rationale
Native American Religious Concerns	NP	The area has been previously disturbed by floodwater events and extreme tamarisk growth. Surface disturbance would be minimal, and no known prehistoric or historical sites will be affected. No issues or concerns about Native American religious sites were raised, particularly because the majority of the project area is in the river channel.
Paleontology	NP	No fossil-bearing strata would be affected by the Proposed Action.
Rangeland Health Standards	NI	Negative impacts to rangeland health are not expected. Adverse impacts to surface hydrology, which could also negatively affect rangeland health, are addressed in the hydrology section.
Recreation	NI	The Proposed Action would not change current recreational use within the project area.
Socioeconomics	NI	The Proposed Action would not result in adverse or beneficial impacts to social or economic values.
Soils	PI	This project would impact the existing soil along the river bank, as well as the existing floodplains. These impacts are evaluated in detail within this EA.
Threatened, Endangered, or Candidate Plant Species	NP	No threatened, endangered, or candidate plant species have the potential to occur in the project area.
Threatened, Endangered, or Candidate Animal Species	PI	The project area may contain habitat for the endangered Yuma clapper rail ( <i>Rallus longirostris yumanensis</i> ) and southwestern willow flycatcher ( <i>Empidonax traillii extimus</i> ). Additionally, there is potential for occurrence of the Virgin River chub (Muddy River Population), a federal candidate species, and the Moapa dace, an endangered species, in the project area. Effects on these species are analyzed in this EA in Section 4.5.1.4. No impacts to desert tortoise ( <i>Gopherus agassizii</i> ) or its habitat are expected to occur. This project will have no effect on any other federally listed species or designated critical habitat.
Wastes (hazardous or solid)	NP	There are no known hazardous materials being produced or stored in the project area.
Water Resources/Quality (drinking/surface/ground)	PI	Implementation of the Proposed Action has the potential to impact surface water, and analysis is included in this EA.
Wetland/Riparian Zones	PI	Implementation of the Proposed Action has the potential to impact existing wetlands along the river, as well as the existing riparian zones. Detailed analysis is presented in Section 4.4.1.2.
Wild and Scenic Rivers	PI	The Muddy River is eligible for inclusion in the National Wild and Scenic Rivers System. Implementation of the Proposed Action has the potential to impact this designation, and analysis is included in this EA.
Wilderness and Wilderness Study Areas	NP	The Proposed Action is not located within or adjacent to designated Wilderness, Wilderness Study Areas, or Instant Wilderness Study Areas.
Woodland/Forestry	NI	Cactus, yucca, acacia, mesquite, and others trees may be present within the project impact area. Cactus, yuccas, acacia, mesquite, and other trees are considered government property and are regulated under the Nevada BLM forestry program. To the extent practical, cactus, yuccas, and trees within the project area are to be avoided. As the project area is within an active floodplain prone to disturbance, potential impacts to forestry products would be considered negligible.
Vegetation (excluding federally listed species)	PI	There are no known occurrences of BLM sensitive species or suitable habitat within the project area. If there are unknown occurrences of BLM sensitive species within the project site, due to the small amount of disturbance, potential impacts would be negligible. The Proposed Action would result in impacts to general vegetation and analysis is included in this EA.
Visual Resources	NI	The proposed project location is within a Visual Resource Management (VRM) Class II area. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape would be low. The fish barriers would be visible, but would not attract the attention of the casual observer. No further analysis is needed for VRM.

**Table 2. Supplemental Authorities and Other Resources Evaluated for the Proposed Action (Continued)**

Resource	Determination	Rationale
Wild Horses and Burros	NP	The Proposed Action is not located in an active herd management area; there will be no impacts to wild horses or burros.
Areas with Wilderness Characteristics	NP	The Proposed Action is located in areas that underwent an initial wilderness inventory and were determined not to meet the elements of wilderness characteristics. This area was not nominated for wilderness characteristics as part of the LVRMP Revision and therefore the BLM did not consider a re-inventory in this area. The Proposed Action is in conformance with the existing Land Use Plan per FLPMA as it relates to management of Lands with Wilderness Characteristics.

Note: NI = Present, but not affected to a degree that detailed analysis is required; NP = Not present in the area affected by the Proposed Action; PI = Present with potential for relevant impacts that need to be analyzed in detail in the EA.

## 3.2 Floodplains

Floodplains along the Muddy River consist mainly of younger alluvial deposits that have been transported by water, but some wind-transported material is included on the low alluvial fans and floodplain. Floodplain dimensions within the project area for both proposed fish barriers are highly variable and are affected by soil characteristics and topography; the floodplain surrounding the proposed Hidden Valley barrier ranges from 800 to 3,000 feet in width, whereas floodplain width at the proposed Narrows barrier ranges between 500 and 1,800 feet. Riparian vegetation within the project area for both proposed barriers is present along the lower banks of the floodplain and is composed primarily of saltcedar (*Tamarix ramosissima*); other commonly observed riparian species included seep willow (*Baccharis salicifolia*), narrowleaf willow (*Salix exigua*), and saltgrass (*Distichlis spicata*). Beyond the riparian zone, upland vegetation is encountered at higher elevations within the floodplain and is dominated by saltbush (*Atriplex* spp.) and perennial herbs, such as Mojave seablite (*Suaeda moquinii*). A more detailed description of these communities is provided in the vegetation section (Section 3.5).

Based on the Federal Emergency Management (FEMA) Flood Insurance Rate Maps for the area, the Proposed Action is located within the 100-year flood zone associated with the Muddy River floodplain (FEMA 2002a, 2002b). Areas located within a 100-year flood zone are susceptible to a high risk of flooding. Flood events may inundate the floodplain and result in the river forming new channels, braiding, and oxbows. Typical flow within the Muddy River leaves fine to medium sand with lesser amounts of silt and gravel that accumulate into bar deposits and active and abandoned channel fill. Within the project area, the floodplain has been disconnected from the Muddy River for at least a century due to deep entrenchment, straightening, and flood and sediment control (Provencher et al. 2005). In several areas the Muddy River streambed is deeply channelized, up to an approximate depth of 20 feet (Beck and Wilson 2006). Diversions off the main stem also affect both flood and base flows.

## 3.3 Hydrology and Water Resources

The project area is situated in the greater Colorado River Hydrographic Basin, and the Upper and Lower Moapa Valley Groundwater Basins. The primary water feature within this basin is the Muddy River, an upstream tributary of the Colorado River; its headwaters originate in the northwest corner of the Upper Moapa Valley and terminate approximately 32 miles to the south in the Overton Arm of Lake Mead. The Muddy River is fed by alluvial-deposited groundwater that discharges from a regional carbonate aquifer to the surface at approximately 20 warm-water seeps and springs in the Warm Springs area (Beck and Wilson 2006; Eakin 1966; Provencher et al. 2005). These springs discharge approximately 37,000 acre-feet of groundwater annually. The Warm Springs area is defined as the terminal discharge point of the White River groundwater flow system (Eakin 1966), which is part of the Regional Carbonate-Rock Province that encompasses about 100,000 square miles of eastern Nevada, western Utah, and parts of

southeastern Idaho and California (Beck and Wilson 2006; Harrill et al. 1983). The groundwater system for the Muddy River Valley generally flows from northwest to southeast toward the junction of the Muddy River and Lake Mead. Depth to groundwater within the project area is shallow and varies from 14 to 23 feet below ground surface (DeMeo et al. 2008). Groundwater discharge emanating from the Muddy River Springs area accounts for the majority of stream flow within the Muddy River. However, seasonal fluctuations in the Muddy River include high flows resulting from late summer monsoon and winter precipitation events. During these events, surface water enters the Muddy River through ephemeral tributaries near Moapa at California Wash and Glendale via Meadow Valley Wash.

The Muddy River is moderately incised up to a depth of approximately 20 feet (Beck and Wilson 2006). The river channel is composed of mud, sand, gravel, and organic debris. Average flow data collected in the Muddy River from 2001 to 2011 show minimal variation in flow rate during a 10-year period (Table 3). Streamflow measurements taken in 2001 at 29 sites within the Moapa Valley reported no measurable net gain or loss in streamflow along the entire reach (Beck and Wilson 2006). Overall, streamflow rates and seasonal fluctuations are much lower than those measured in adjacent river systems such as the Virgin River (USGS 2012). Data for Mean Suspended Sediment Discharge measured downstream of the project area in Overton, Nevada are also provided in Table 4 (USGS 2012). Recent wildfires and storm events in the project area in 2010 resulted in increased sediment discharge into the Muddy River (Shattuck et al. 2012).

**Table 3.** Monthly Mean Discharge (2001–2011) and Monthly Mean Suspended Sediment Discharge (2008–2009) for Selected Sites on the Muddy River

Month	Mean Discharge (cfs)		Mean Suspended Sediment Discharge (tons per day)
	Moapa, NV (09416000)	Glendale, NV (09419000)	Overton, NV (09419507)
January	35	66.5	–
February	36	37.2	14.0
March	36	36.7	10.0
April	35	35.6	11.4
May	35	34.6	14.7
June	32	30.9	4.7
July	31	30.2	6.2
August	32	31.5	–
September	32	30.4	11.0
October	31	34.7	–
November	33	36.3	6.2
December	35	56.9	–
<b>Mean</b>	<b>33.6</b>	<b>38.5</b>	<b>9.8</b>

Source: USGS (2012)  
– = data unavailable

Table 4 provides peak stream flow data at gage stations upstream (California Wash) and downstream (Muddy River) of the proposed Narrows fish barrier site (Ryan 2007). Peak flows during major flood events recorded within the Muddy River during recent flood events ranged from 8,600 to 16,400 cfs.

**Table 4. Peak Discharges at Selected Sites along the Muddy River, 1950–2005**

Gaging Station Name	Station No.	Largest Peak Discharge on Record (cfs)	Date of Peak Discharge	Period of Record	Peak Discharge (cfs) Recorded during Flood Event (Jan. 10–11, 2005)
California Wash near Moapa, NV	09417300	30,600	8/10/1981	1950–2005	800
Muddy River near Glendale, NV	09414000	16,400	8/10/1981	1981, 1987–2005	8,600

Source: Ryan (2007)

The general water quality of the Muddy River is poor due to high levels of *Escherichia coli*, Total Phosphorus, and Fecal Coliform (NDEP 2012). Because of these elevated contaminant levels, the Muddy River has been listed on the State of Nevada's 303(d) Impaired Waters List. Water used for domestic purposes is collected from groundwater near the Warm Springs area, in the Upper Moapa Valley Basin, and piped down to the towns of Logandale and Overton. A series of channels and ditches along the Muddy River have historically provided diversionary flow for municipal and agricultural irrigation to the communities of Moapa, Glendale, Logandale, and Overton. Diversions from the Muddy River also provide water to the Reid Gardner Power Generating Station and the Moapa Valley Dairy. However, recent water rights purchases by the Southern Nevada Water Authority (SNWA) on the Muddy River total approximately 20,00 acre-feet per year and would likely reduce historical trends in flow diversion within the project area (SNWA 2009). Evaporation rates also affect the total volume of water within the Muddy River. Based on corrected pan evaporation rates observed in Logandale, it is assumed that water evaporation in the project area occurs at a rate of 72.4 inches per year (Western Regional Climate Center 2004).

### 3.4 Soils

The soil descriptions in this section are based on information from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) web soil survey (NRCS 2012). The web soil survey data are based on the Soil Survey of the Virgin River Area, Nevada and Arizona, U.S. Department of Agriculture Soil Conservation Service (NV608). For the purposes of this section, terminology consistent with that used by the NRCS was used to identify specific soil types in the proposed project area.

At the Hidden Valley site, soils include Bard gravelly fine sandy loam, 2% to 8% slopes; Gila loam, water table; and Overton silty clay, slightly saline (NRCS 2012). The Hidden Valley site is consistent with typical lowland desert riparian communities, with landforms consisting of alluvial fan remnants and floodplains. Floodplain soils consist variably of moderately well-drained loam derived from mixed sources and very poorly drained silty clay derived from sedimentary rock. Floodplain soils in the area range in salt content from nonsaline to strongly saline. Floodplain settings are susceptible to occasional flooding episodes. Sedimentary texture becomes coarser upslope; upland alluvial fan remnants contain well drained gravelly fine sandy loam alluvium derived from limestone and dolomite. Indurated petrocalcic horizons are encountered 14 to 20 inches below the surface in upland soils.

At the Narrows site, soils include Calico loamy fine sand, coarse variant, drained; and Rock land-St. Thomas association, very steep (NRCS 2012). The Narrows site contains floodplain soils consisting

of somewhat poorly drained loamy fine sand derived from mixed sources. Floodplain soils in the area range in salt content from nonsaline to strongly saline. In this area, the Muddy River floodplain is bordered by mountain slopes veneered in well-drained cobbly loam colluvium overlying residuum weathered from limestone and dolomite. In general, drainage conditions improve when moving upslope from shallow gradient, fine-grained floodplain soils to more steeply sloping, coarse-grained upland topographic positions. Upland settings are less vulnerable to flooding events, which occur at low to moderate rates in floodplain settings.

### 3.5 Vegetation

Vegetation resources in the project area consist of three distinct types—upland, wetland and riparian—and noxious and invasive species. Within the upland vegetation community there are substantial areas that have been previously disturbed. Disturbed areas are distinguished from undisturbed areas in order to better describe the context of impacts. The extent of upland and wetland vegetation was assessed during site reconnaissance and field surveys for a preliminary jurisdictional determination (SWCA Environmental Consultants [SWCA] 2012). Vegetation mapping was done using a combination of global positioning system (GPS) data collected in the field and analysis of aerial imagery using geographic information system (GIS) technology.

The USS characterizes the Muddy River channel as being moderately incised (Beck and Wilson 2006), describing the channel as approximately 20 feet deep. This characterization is consistent with field observations in which the river banks were consistently observed to be 45-degree angles or steeper. Incised morphology of the channel has resulted in a condition in which wetland soils, and therefore wetland vegetation, are limited to an extremely narrow area surrounding open water. Riparian vegetation is more broadly dispersed, occupying the interface between wetland vegetation and upland vegetation. Upland vegetation was generally observed at the upper banks.

Vegetation density is quite different between the two sites. The Hidden Valley site is bounded by access roads, limiting the surrounding upland vegetation along the upper banks. In general, the Hidden Valley site has an open canopy and consists primarily of shrub and grass canopies with interspersed trees. In contrast, the Narrows site is densely vegetated. The riparian community has a tree and shrub canopy which was generally observed to be 75% to 90% closed (SWCA 2012).

#### 3.5.1 Upland Vegetation

Generally the upland vegetation along the Muddy River occupies the upper banks of the river channel but occurs near the boundary of the OHWM in some locations. The upland vegetation in the project area is best characterized as saltbush scrub. The saltbush scrub vegetation community is primarily vegetated by perennial shrubs, such as saltbush and perennial herbs, such as Mojave seablite. Saltbush scrub vegetation was interspersed with honey and screwbean mesquite (*Prosopis glandulosa* and *P. pubescens*), especially at the Narrows site. A prominent species occurring in the uplands at the Hidden Valley site included pale desert-thorn (*Lycium pallidum*). Upland vegetation covers 0.38 acre at the Hidden Valley site and 0.25 acre at the Narrows site.

Disturbed lands are also present in the uplands and consist of large sparsely vegetated or unvegetated areas, including roads. Both the Hidden Valley and Narrows sites are traversed by existing roads but the Hidden Valley site also includes one large, previously disturbed area. Disturbed lands comprise 0.2 acre at the Hidden Valley site; no substantial disturbed areas exist at the Narrows site.



### **3.5.2 Wetland/Riparian**

Wetland and riparian vegetation is tolerant of soil conditions that remain saturated with water for extended periods of time. True wetland plant species require saturated or inundated soil conditions while riparian plants are able to tolerate periods of saturation. Wetland and riparian vegetation communities are important as they provide habitat, and movement and migration corridors for wildlife (Levick et al. 2008).

Wetland and riparian vegetation in the project area is limited resulting from the steeply incised banks and narrow channel of the Muddy River. The river morphology creates a situation in which saturated soil conditions are limited to a narrow area surrounding open water. The only dominant wetland plant species observed during site reconnaissance and field surveys for a preliminary jurisdictional determination was cattail (*Typha* sp.). Saltcedar was the most commonly observed riparian tree species. Other commonly observed riparian species included seep willow, narrowleaf willow, and saltgrass. Wetland and riparian areas comprise 0.11 acre at the Hidden Valley site and 0.2 acre at the Narrows site.

### **3.5.3 Noxious Weeds/ Invasive Species**

Noxious and invasive weeds are non-native and undesirable plant species. Noxious weeds crowd out and displace native vegetation and may have an impact on crops, livestock, and land (Nevada Weed Action Committee 2000). Authority, control, and eradication of noxious weed species are regulated by NRS 555.005-201. Species designated as invasive are not regulated by Nevada law but may have substantial negative effects on native vegetation and therefore, these species are often discussed in conjunction with noxious weeds.

Saltcedar is a category C noxious weed (Nevada Department of Agriculture 2012) in the state of Nevada. This species occurs in low densities at the Hidden Valley site but is abundant at the Narrows site. Saltcedar was initially introduced from Asia and has proliferated in the desert Southwest where it now commonly occurs along waterways and other areas of increased water availability. Treatment of saltcedar is best accomplished through a combination of methods (Creech et al. 2010). No other noxious species were observed during the site reconnaissance and field surveys.

Mojave seablite was a commonly observed invasive species, especially in the Hidden Valley site. Although a native plant, this species has weedy tendencies. It can grow very densely and crowd out other native vegetation, creating a monotypic stand. Other invasive species commonly found throughout southern Nevada include cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), and Russian thistle (*Salsola tragus*).

## **3.6 Wildlife**

### **3.6.1 Terrestrial Wildlife**

The project area consists of riparian habitat surrounded by Mojave Desert habitat. Typical upland desert habitat species consist of small mammals, birds, and reptiles that are common and widely distributed. Conversely, desert riparian communities generally exhibit much greater biodiversity than do upland desert communities. Riparian corridors in the desert Southwest provide habitat, and movement and migration corridors for wildlife (Levick et al. 2008).

A variety of wildlife species typically inhabit desert upland and riparian communities within the region and may potentially occur in the project area. Typical mammal species may include kit fox (*Vulpes macrotis*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), western spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), and bobcat (*Lynx rufus*).

Common reptile species may include desert iguana (*Dipsosaurus dorsalis*), collared lizard (*Crotaphytus collaris*), zebra-tailed lizard (*Callisaurus draconoides*), western fence lizard (*Sceloporus occidentalis*), coachwhip (*Coluber flagellum*), Mojave patch-nosed snake (*Salvadora hexalepis*), glossy snake (*Arizona elegans*), and Mojave desert sidewinder (*Crotalus cerastes*). Typical amphibian species may include red-spotted toad (*Anaxyrus punctatus*), Woodhouse's toad (*Anaxyrus woodhousii*), and Pacific treefrog (*Pseudacris regilla*).

### 3.6.2 Migratory birds

Migratory birds are protected under the Migratory Bird Treaty Act of 1918, as amended (16 USC 703 *et seq.*). The USFWS defines a migratory bird as any species or family of birds that live, reproduce, or migrate within or across international borders at some point in their annual life cycle. Almost all bird species with potential to occur within the project area are migratory bird species.

The Muddy River supports a high diversity of migratory birds, with as many as 230 species reported from a 4-year period (Lund, unpublished data; referenced from Provencher and Andress 2004). Of these observed species it is estimated that 76 species breed along the river (Provencher et al. 2005). In addition to general migratory bird species, a number of Clark County sensitive species occur on the upper Muddy River and include: Southwestern willow flycatcher (*Empidonax traillii extimus*; also federally listed; discussed in Section 3.6.4), Arizona Bell's vireo (*Vireo bellii arizonae*), blue grosbeak (*Passerina caerulea*), phainopepla (*Phainopepla nitens*), summer tanager (*Piranga rubra*), vermilion flycatcher (*Pyrocephalus rubinus*), and yellow-billed cuckoo (*Coccyzus americanus*; also a federal candidate for listing).

Provencher and Andress (2004) completed an assessment of the Muddy River for the Clark County Multiple Species Conservation Plan and found that riparian woodland habitat had 86 associated species and included yellow-billed cuckoo, summer tanager, blue grosbeak, yellow warbler (*Dendroica petechia*), Lucy's warbler (*Oreothlypis luciae*), and western kingbird (*Tyrannus verticalis*). Riparian shrublands had 70 associated species and included yellow-breasted chat (*Icteria virens*), blue grosbeak, indigo bunting (*Passerina cyanea*), Bullock's oriole (*Icterus bullockii*), loggerhead shrike (*Lanius ludovicianus*), and crissal thrasher (*Toxostoma crissale*). Mesquite bosque habitat had 60 associated species including phainopepla, Lucy's warbler, verdin (*Auriparus flaviceps*), and vermilion flycatcher. Riparian marsh, which is limited along the Muddy River, had 13 associated species, including Virginia rail (*Rallus limicola*), sora (*Porzana Carolina*), and marsh wren (*Cistothorus palustris*). Raptors known to nest in the area include the great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*) and American kestrel (*Falco sparverius*). Golden eagles (*Aquila chrysaetos*), prairie falcons (*Falco mexicanus*), and peregrine falcons (*Falco peregrinus*) may also use this area for foraging (NDOW 2005).

The quality of migratory bird habitat is very different between the Hidden Valley and Narrows sites. Habitat quality is low at Hidden Valley, where vegetation is sparse. The riparian vegetation community is limited to sporadic trees and provides very little canopy cover. The shrub community is primarily dominated by monotypic stands of Mojave seablite with an understory of saltgrass. In contrast, vegetative cover is extensive at the Narrows and provides relatively higher-quality migratory bird habitat. Riparian vegetation forms a nearly complete canopy above the open water and extends approximately 30 feet from either edge of the channel. Beyond the riparian vegetation, there are large mesquite trees and dense upland vegetation that primarily consists of saltbush.

### 3.6.3 Fish

This project would occur in habitat of four endemic species: Moapa speckled dace, Virgin River chub, Moapa dace, and the Moapa White River springfish (*Crenichthys baileyi moapae*). With exception of the

Moapa White River springfish, these species are either State-, BLM-, and/or federally protected and are described in further detail in Sections 3.6.4 and 3.6.5. Native fish in the Muddy River are threatened by non-native species that have migrated upstream from Lake Mead. Thirteen non-native species have been documented in the Muddy River (Provencher and Andress 2004) and include: shortfin molly (*Poecilia mexicana*), mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), red shiner (*Notropis lutrensis*), golden shiner (*Notemigonus crysoleucas*), black bullhead (*Ictalurus melas*), channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), largemouth black bass (*Micropterus salmoide*), green sunfish (*Chaenobryttus cyanellus*), rainbow trout (*Salmo gairdneri*), and blue tilapia (*Oreochromis aurea*). High predation rates, primarily by blue tilapia, threaten endemic species (Provencher and Andress 2004).

Fish habitat in the vicinity of the Hidden valley site is composed of deep runs and pools as a result of the low gradient river channel (Bio-West 2012). Substrates in the area are primarily composed of silt and sand (Bio-West 2012). Vegetation cover along the banks is sparse, with little overhanging vegetation, and little downed, woody debris in the channel. In contrast, fish habitat in the Narrows is composed of riffles, runs, and pools which result from the steep gradient of the channel; the substrate is primarily composed of silt and sand, with an abundance of cobble and gravel in the riffle and fast-run habitat types (Bio-West 2012). Vegetative cover along the banks is dense with an overhanging canopy along much of the river. Large, downed, woody debris is common in the channel.

### 3.6.4 Threatened and endangered species

The Muddy River is one of the Mojave Desert's most important areas of biodiversity, providing habitat for many species of concern, as well as a unique array of Mojave Desert aquatic and riparian habitats (Provencher et al. 2005). Of the 16 USFWS-listed wildlife species occurring in Clark County, Nevada, four were identified as having the potential to occur within the project area (Table 5). Such federally listed species receive protection under the Endangered Species Act of 1973, as amended. Although the project area is located within the range of these four species, no suitable habitat for these species is present.

**Table 5.** USFWS Listed Threatened and Endangered Species within the Project Area

Common Name	Scientific Name	Status*	Probability of Habitat
<b>Fish</b>			
Moapa dace	<i>Moapa coriacea</i>	E	None
<b>Reptiles</b>			
Mojave Desert tortoise	<i>Gopherus agassizii</i>	T	None
<b>Birds</b>			
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	None
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	E	None

Source: USFWS (2012)

\* E = Endangered, T = Threatened

### MOAPA DACE

Moapa dace is a species of minnow found throughout the headwaters of the Muddy River system. Currently, Moapa dace occupies stream habitat in five thermal headwater springs and the primary stem of the upper Muddy River, within the Moapa National Wildlife Refuge located in the Warm Springs area of the upper Moapa Valley in northeastern Clark County, Nevada. Moapa dace is unique because it is the

only representative of its genus and is found nowhere else in the world. Moapa dace was listed as an endangered species in 1967 and is a covered species in the Muddy River Recovery Implementation Program. Threats to its survival include modification, degradation, and loss of habitat; construction of impoundments; and introduction of non-native fishes (USFWS 2009). One of the requirements identified in the Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem to de-list Moapa dace is the removal of non-native fishes from its habitat (USFWS 1995).

The project area does not provide suitable habitat for Moapa dace, which require warm water (82°F–89°F [28°C–32°C]) for reproduction; as a result, the current distribution of Moapa dace is restricted to the Warm Springs Natural Area, and tributaries and upper reaches of the Muddy River, north of the project area (Deacon and Bradley 1972; USFWS 1995). Water temperature data within the project area range between 49.1°F and 85.1°F (9.5°C–29.5°C), averaging 69.1°F (20.6°C) over a 6-year period (USGS 2012). Moapa dace were not observed during fish surveys conducted in 2011 between river miles 7.5 and 30.5, which encompasses the project area (Shattuck et al. 2012).

#### **MOJAVE DESERT TORTOISE**

The distribution of desert tortoise covers the broadest range of latitude, climate, habitats, and biotic regions of any North American tortoise (Germano et al. 1994). The range of desert tortoise roughly approximates the distribution of the creosote bush scrub community and includes the Mojave and Sonoran Deserts in southern California, southern Nevada, northwestern Arizona, the southwest corner of Utah, and Sonora and northern Sinaloa, Mexico. Habitat requirements for desert tortoise are somewhat variable with regard to the different regions in which it occurs and seem to correspond to genetic and morphological differences, as well. In Nevada, Mojave Desert tortoise typically is found on flats, valleys, bajadas, and rolling hills, generally at 2,000 to 3,500 feet amsl. No suitable Mojave Desert tortoise habitat occurs within the project area.

#### **SOUTHWESTERN WILLOW FLYCATCHER**

Southwestern willow flycatcher breeds in dense, mesic riparian habitats at scattered, isolated sites in New Mexico, Arizona, southern California, southern Nevada, southern Utah, southwestern Colorado, and, at least historically, extreme northwestern Mexico and western Texas (Unitt 1987). In the Southwest, most breeding territories are found within small breeding sites containing five or fewer territories (Durst et al. 2008). Breeding southwestern willow flycatchers are riparian obligates, nesting in relatively dense riparian vegetation where surface water is present or soil moisture is high enough to maintain the appropriate vegetation characteristics (Sogge et al. 2010). However, hydrological conditions in the Southwest can be highly variable within a season and between years, so water availability at a site may range from flooded to dry over the course of a breeding season or from year to year. Vegetation characteristics of southwestern willow flycatcher breeding habitat generally include dense tree or shrub cover that is ≥ 10 feet tall (with or without a higher overstory layer), dense twig structure, and high levels of live green foliage (Allison et al. 2003); many patches with tall canopy vegetation also include dense midstory vegetation in the 3–16 feet range. Beyond these generalities, the species shows adaptability in habitat selection, as demonstrated by variability in dominant plant species (both native and exotic), size and shape of breeding patch, and canopy height and structure (Sogge et al. 2010; USFWS 2002).

Based on a review of the available data and a site reconnaissance visit conducted by SWCA in 2012, neither fish barrier site appears to contain habitat at this time to support southwestern willow flycatcher. The vegetation at the Hidden Valley barrier site does not contain the structural characteristics, specifically patch size, to support willow flycatchers. The Narrows barrier site does contain vegetation (i.e., saltcedar of moderate height) with the structural characteristics to support flycatchers, but does not have the appropriate hydrology.

## **YUMA CLAPPER RAIL**

Yuma clapper rail prefers unfragmented freshwater areas with emergent riparian and marsh vegetation composed of moderate- to high-density stands of cattail and bulrush (*Scirpus* sp.) adjacent to shorelines. Within this habitat, Yuma clapper rail seems to prefer a wet substrate, such as a mud flat, sandbar, or slough bottom. Saltcedar are typically used by Yuma clapper rail only when floods deeply inundate cattail marshes and surface flows spread into adjacent saltcedar stands. Based on SWCA's site reconnaissance visit in 2012, it was determined that no suitable habitat for Yuma clapper rail is present in the project area.

### **3.6.5 Special Status Species**

Species included on the sensitive species list for the state of Nevada, which is maintained by Nevada's Natural Heritage Program (NNHP), are also included as special status species (NNHP 2010a, 2010b). The NNHP has identified four State-sensitive species as having the potential to occur within the project area: Moapa speckled dace, the Muddy River population of Virgin River chub, banded Gila monster (*Heloderma suspectum cinctum*), and phainopepla. These species are protected under Nevada Administrative Code 503 and are also considered special status species by the Nevada BLM.

## **MOAPA SPECKLED DACE**

Moapa speckled dace is a small cyprinid fish that averages 3 inches in length and typically lives for 3 years. Moapa speckled dace prefers the cooler water temperatures below the Warm Springs area, and has been documented within the project area (Shattuck et al. 2012). Larval speckled dace are primarily plankton feeders, while the adults feed primarily on aquatic insects and algae. Speckled dace prefer the lower horizon of shallow cobble riffles. Moapa speckled dace inhabits the Muddy River in low numbers; fish surveys conducted in 2011 documented one individual between river miles 7.5 and 30.5, which encompasses the project area (Shattuck et al. 2012). Threats to Moapa speckled dace include deterioration in water quality, non-native fish, and parasites (SNWA 2012; USFWS 1995).

## **VIRGIN RIVER CHUB**

Currently occupied habitat of Virgin River chub is found in Utah, Arizona, and Nevada, and includes only 65.3% of the chub's historical range. The present range of this species is very limited and, in Nevada, is restricted to the Muddy and Virgin Rivers. Two distinct populations of Virgin River chub are recognized by the USFWS: the Virgin River population, which is currently listed as federally endangered and occurs outside the project area; and the Muddy River population, which is State- and BLM-sensitive, and occurs within the project area (NNHP 2010a; USFWS 2012). Impacts analyzed in this document are limited to the Muddy River population of Virgin River chub. The Virgin River chub lives in swift, turbid waters, so it is often found in deep pools near large boulders and root snags that offer it protection from being swept downstream. Fish studies conducted in 2011 documented 34 individuals of Virgin River chub within the project area (Shattuck et al. 2012). Threats to the Virgin River chub include non-native fish, reduced flows, habitat alteration, disease, floods, and toxic spills (USFWS 1994, 1995).

## **BANDED GILA MONSTER**

Banded Gila monster is one of only two species of venomous lizards in the world. This reptile is a stout-bodied lizard that grows up to 14 inches long. It has black, orange, pink, or yellow broken blotches, bars, and spots, with bands extending onto its blunt tail. Banded Gila monster lives in Mojave Desert scrub with gravelly and sandy soils and is found below 5,000 feet amsl. Banded Gila monster habitat is found in canyon bottoms or arroyos with permanent or intermittent streams, near water or moist soils. In these areas, individuals are often found under rocks, in burrows of other animals, and in holes it digs itself. Gila

monster is diurnal, especially in the spring (Stebbins 2003). Gila monster records exist for the Moapa area, immediately north of the project area (NNHP 1998). Suitable habitat for the banded Gila monster does exist within the project area, although no Gila monsters or sign were observed during the site reconnaissance.

#### **PHAINOPEPLA**

Phainopepla is a medium-sized bird that occupies upland desert and arid woodland habitats ranging from Mexico to the southwestern United States. Phainopepla forage primarily on berries, but will also take small insects. In Nevada, phainopepla breed exclusively in stands of mesquite and acacia that produce mistletoe berries (Floyd et al. 2007). Patches of honey and screwbean mesquite identified within upland portions the project area may provide suitable phainopepla habitat.

### **3.7 Wild and Scenic Rivers**

Currently, the stretch of the Muddy River within the proposed project area is eligible for inclusion in the National Wild and Scenic Rivers System. The Wild and Scenic River Act, as amended (16 USC 1271), protects and preserves selected rivers that possess outstandingly remarkable values (ORVs). These values are stated as being scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values. The act aims to preserve rivers and their immediate environment, maintain free-flowing conditions, protect water quality, and fulfill other vital national conservation purposes. The act also requires that all eligible stretches of river be protected until a determination of suitability can be completed. For a river to be eligible to become part of the National System of Wild and Scenic Rivers, it must possess one or more ORVs and be free flowing. However, the existence of minor structures does not automatically restrict a river from this designation. The segment of the Muddy River that falls within the project area has the ORVs of recreation, wildlife, cultural resources, and fish. It is eligible for its recreational value.

## **4.0 ENVIRONMENTAL CONSEQUENCES**

### **4.1 Floodplains**

#### **4.1.1 Proposed Action**

The proposed fish barrier at the Narrows site would cross approximately 68 feet of the Muddy River floodplain and 50 feet of the floodplain at the Hidden Valley site. Once completed, the fish barriers would alter regular flow and flooding regimes of the Muddy River. The barriers would potentially deplete the sediment load in the Muddy River as sediment is deposited in the slackwater environment created by the impoundment. In turn, channelized water flowing over the fish barriers would lack normal sediment loads and promote erosion and potential scouring immediately downstream. This could ultimately form a narrower floodplain directly downstream of the barriers, although this is not anticipated to have an extensive reach downstream. Stream flow is anticipated to return to its normal hydrologic regime once the impoundment becomes level with the height of the barrier.

Deposition would occur on the upstream side of each barrier as water enters the impoundment. Sedimentation is anticipated to accumulate until it becomes level with the lowest elevation step of the fish barriers, which would permanently raise the stream profile. The elevated stream channel is anticipated to continue approximately 3,000 feet upstream, until sediments begin to merge with the natural upstream gradient. Ultimately, the heightened floodplain profile would increase the duration of inundation of portions of the floodplain, as well as increasing the width of the floodplain upstream of the barriers during flooding events.

During storm events, elevated water levels may result in localized flooding upstream of the impoundment. However, the fish barriers have been developed to handle flows of up to 45,000 cfs, which exceeds observed flow rates during recent flood events (Ryan 2007) and expected flow rates from a 100-year flood event. Although impacts may occur as a result of upstream flooding, it is anticipated that these impacts would be short-term and restricted to a localized area within the existing floodplain.

#### **4.1.2 No Action Alternative**

Under the No Action Alternative the proposed fish barriers would not be completed. Floodplains at the project location would continue to be subject to local conditions and regional trends.

#### **4.1.3 Mitigation**

Environmental protection measures listed in Section 2.1.4 adequately minimize impacts; therefore, no mitigation measures are needed.

### **4.2 Hydrology and Water Resources**

#### **4.2.1 Proposed Action**

##### **HYDROLOGY**

Development of the proposed fish barriers would directly impact waters of the Muddy River. Impacts would occur both during the construction phase of the project and following completion of the fish barriers. The construction phase of the project would occur during the fall when water flows are anticipated to be lower than during the spring. In order to safely route the river, a temporary channel would be constructed through each work site. Following construction, the channel would be returned to natural conditions.

The Proposed Action would create an impoundment upstream of each barrier site. The overflow crest would be contained within the OHWM, and therefore at typical flows (approximately 34 cfs), the impoundment depth would remain within the OHWM and would extend 3,000 feet upstream from the barrier. Due to the incised structure of the existing channel, these impoundments would increase water depth, but changes to surface area and associated evaporation rates would be negligible.

##### **WATER QUALITY**

Water quality may be directly impacted during the construction phase of the project due to increased sediment deposition resulting from downstream excavations. The Muddy River transports a large amount of sediment, much of which will be deposited upstream of the barriers, essentially raising the elevation of the stream bed. The majority of the sediment will be deposited in the main river channel, leaving smaller pools and channels along the edges of the main channel.

The proposed project would have temporary direct impacts to water quality through the addition of rotenone and potassium permanganate to the Muddy River. Under the Proposed Action, rotenone would be neutralized with potassium permanganate. Potassium permanganate oxidizes rotenone and rotenone quickly, and the resultant manganese oxide is a biologically inactive compound. Neutralization of rotenone typically occurs within the distance water is expected to flow in 30 minutes (Finlayson et al. 2010). In the unlikely event that some rotenone is not neutralized, it would degrade naturally, likely over a period of several days (Ling 2003). Further, rotenone is a non-persistent chemical. It does not accumulate in water, soil, plants, or animals.



Because of the neutralization of rotenone with potassium permanganate, most impacts to water quality would be limited to the length of treatment (approximately 2 to 3 days (AMHS)). As a result, although the impacts to water quality would be moderate in the short term, there would be no long-term impacts.

Following rotenone treatment, dead fish would accumulate along the river banks. Decomposition can increase nutrient inputs to the river, which could lead to algal blooms and subsequent drops in dissolved oxygen. Dissolved oxygen levels could also drop if large amounts of fish are left decomposing in sections of the river with extremely low streamflow. However, following salvage operations, fish densities should be low enough that the amount of decomposition would not be sufficient to substantially alter water quality in the Muddy River. As a result, indirect effects would be negligible and short-term.

Development of the Proposed Action would impact hydrology and water resources within the Muddy River. Impacts to hydrology and water resources are anticipated to be minor and adverse due to the short-term effects and small scale of these impacts. Environmental protection measures in Section 2.1.2 would further reduce these impacts. The Proposed Action may involve dredging or filling of Waters of the U.S., which would require the cooperation of the USACE. Compliance with the Clean Water Act would require obtaining any necessary permits from the Clark County Regional Flood Control District, Nevada Division of Water Resources, NDEP, and USACE (i.e., 401 and 404).

#### **4.2.2 No Action Alternative**

Under the No Action Alternative, the fish barriers would not be built. There would be no changes to hydrology resources. No impoundments would be created, and flow rates, sediment flow, and evaporation rates would remain subject to local conditions.

#### **4.2.3 Mitigation**

Environmental protection measures listed in Section 2.1.2 adequately minimize impacts; therefore, no mitigation measures are needed.

### **4.3 Soils**

#### **4.3.1 Proposed Action**

Implementation of the Proposed Action would result in minor disturbance to upland soils in the two project area locations, consisting largely of increased soil compaction in areas subjected to heavy machinery traffic, and increased erosion and soil loss in areas experiencing vegetation loss. Vegetation loss would likely occur one or two ways: from intentional removal for clearance purposes, or as unintentional loss via machinery movement and/or human trampling of the work site areas. Upland portions of the project area would be more vulnerable to wind and water erosion, particularly on hillslope components with steeper gradients. The effects of soil compaction would likely be most pronounced in upland areas as well. However, impacts of the Proposed Action to upland soils in the project area would occur in the short term and would be limited to 0.62 acre.

Floodplain soils in the project area would be affected by the construction of the two fish barriers, which will result in the formation of an impoundment area, raised water levels immediately upstream of the barrier, and changes in stream energy and sediment load. The fish barrier would create an artificial obstruction to water flow, thereby increasing divergent flow and decreasing transport energy upstream of the barrier. This decrease in energy would result in the formation of a slackwater environment within the impoundment area, allowing sediment to settle out of suspension and deposit on the channel bed upstream of the barrier. Coarser particles, such as sand, which require the most energy to transport and are therefore

the first to settle out of suspension, will be selectively removed from channel flow. Finer-grained silt and clay particles may also be deposited in the impoundment area due to greatly diminished energy upstream of the barrier. Conversely, soil erosion would be accelerated immediately downstream of the fish barriers, where increased energy resulting from convergent flow may scour sediment from the channel bed. However, these impacts would be minimized by the use of riprap placed downstream of the fish barriers.

No hydric soils are expected to be impacted either within the project area or immediately downstream of the fish barrier. Creation of the impoundment area may eventually result in a net gain of hydric soils, which form under conditions of saturation, flooding, or ponding sustained long enough to develop anaerobic conditions. Overall, impacts of the Proposed Action to floodplain soils within and downstream of the project area are expected to be minimal and temporary.

#### **4.3.2 No Action Alternative**

Under the No Action Alternative, the proposed fish barriers would not be constructed. Soils would continue to be influenced by present conditions.

#### **4.3.3 Mitigation**

Environmental protection measures listed in Section 2.1.2 adequately minimize impacts; therefore, no mitigation measures are needed.

### **4.4 Vegetation**

#### **4.4.1 Proposed Action**

##### **UPLAND VEGETATION**

Upland vegetation would be cleared for equipment staging areas, site access, and construction activities. These activities would result in removal, crushing, and trampling of vegetation which would impact approximately 0.38 acre of upland vegetation at the Hidden Valley site and 0.25 acre of upland vegetation at the Narrows site. Impacts to vegetation at the Hidden Valley site would be minimized through staging equipment on a previously disturbed area 0.2 acre in size. A temporary loss of vegetation would occur while disturbed areas are reestablished with native vegetation. In a desert environment, upland vegetation may take 5 to 10 years to reestablish. The loss of vegetation would be mitigated through seeding as described in Section 2.1.2.

Increased levels of fugitive dust are anticipated to cause indirect short-term impacts to upland vegetation through an unquantified loss of photosynthetic output. Impacts resulting from fugitive dust would be mitigated through a dust control permit which would identify appropriate measures of dust reduction.

Direct and indirect impacts to upland vegetation resources are anticipated to be minimal. Species within areas that would be impacted are relatively common throughout the Mojave Desert and the vicinity of the project area. The loss of individual plants would have a negligible effect on the remaining population. Furthermore, mitigation measures proposed in Section 4.4.3 would further reduce impacts to upland vegetation resources.

##### **WETLAND/RIPARIAN**

Wetland and riparian vegetation would be cleared for site access and construction of the fish barriers. These activities would result in removal, crushing, and trampling of vegetation which would impact approximately 0.10 acre of wetland and riparian vegetation at the Hidden Valley site and 0.18 acre of wetland and riparian vegetation at the Narrows site. Up to 0.01 acre of wetland and riparian vegetation at

the Hidden Valley site and 0.02 acre of wetland and riparian vegetation at the Narrows site would be permanently lost from the fish barriers. Due to the resiliency of wetland and riparian vegetation temporary impacts would short-term. Vegetation is expected to resprout the following season and would likely be fully established within 5 years. Additionally, loss of vegetation will be mitigated through seeding as described in Section 4.4.3.

Increased levels of fugitive dust are anticipated to cause indirect short-term impacts to upland vegetation through an unquantified loss of photosynthetic output. Impacts resulting from fugitive dust will be mitigated through a dust control permit which will identify appropriate measures of dust reduction.

#### **NOXIOUS WEEDS/ INVASIVE SPECIES**

The spread and introduction of noxious and invasive weed species is a primary concern during construction activities. Construction equipment is capable of transporting and spreading weed seed or plant parts (such as root material) from infested to non-infested areas. Implementation of the Proposed Action would result in the removal of saltcedar at the Narrows site. A noxious weed management plan will be included as part of the Proposed Action and would mitigate the spread of noxious and invasive species. Additionally, restoration and reclamation of native vegetation will increase competition with noxious and invasive species.

##### **4.4.2 No Action Alternative**

Under the No Action Alternative, neither fish barrier would be constructed. The vegetation resources in the project area would remain in the current condition.

##### **4.4.3 Mitigation**

Impacts to vegetation resources would be mitigated through the creation and implementation of a site-specific restoration plan and noxious weed management plan. These plans would identify specify and appropriate restoration methods for impacted vegetation communities and may include seeding and live shrub planting. Control of noxious weeds would be accomplished through implementation of all standard stipulations and mitigation measures for weed control on lands managed by the BLM Southern Nevada District Office. The noxious and invasive weed plan would include treatments that will maintain weed populations at or below ambient levels.

## **4.5 Wildlife**

### **4.5.1 Proposed Action**

#### **TERRESTRIAL WILDLIFE**

Development of the Proposed Action would result in a permanent loss of habitat that would include a total of 0.03 acre (0.01 acre at Hidden Valley and 0.02 acre at the Narrows) of wetland and riparian habitat for the footprint of the fish barriers. Short- and long-term habitat loss would occur within temporary use areas. Long-term habitat loss would occur within 0.62 acre of temporary use areas (0.37 acre at Hidden Valley and 0.25 acre at the Narrows) located in the uplands, where vegetation reestablishment is relatively slow. Desert vegetation may take 5 to 10 years to reestablish to a suitable density. Short-term losses in habitat would occur within 0.19 acre of temporary use areas (0.01 acre at Hidden Valley and 0.18 acre at the Narrows) in wetland and riparian areas, which would recover quickly; resprouting would likely occur in the following year.

Potential adverse impacts to terrestrial wildlife may also include short-term disturbance resulting from construction. Construction-related human presence will increase noise and vibration which may stress or harass terrestrial wildlife. Predator populations may temporarily increase; common ravens and coyotes are often attracted to litter at construction sites. Direct mortality may occur to less mobile species from crushing by construction activities or other vehicle-related accidents.

Overall, impacts to terrestrial wildlife are anticipated to be minimal. Temporary and permanent loss of habitat would occur on a very limited portion of habitat, relative to the amount of available habitat along the Muddy River. Impacts related to construction activities would be mitigated through implementation of environmental protection measures described in Section 2.1.2. Furthermore, the general terrestrial wildlife species within the project area are commonly found within the Mojave Desert and impacts to individuals are unlikely to have any local or regional population impacts.

#### **MIGRATORY BIRDS**

Development of the Proposed Action would result in a permanent loss of 0.03 acre (0.01 acre at Hidden Valley and 0.02 acre at the Narrows) for the footprint of the fish barriers. Short- and long-term habitat loss would occur within temporary use areas. Long-term habitat loss would occur within 0.62 acre of temporary use areas (0.37 acre at Hidden Valley and 0.25 acre at the Narrows) located in the uplands, where vegetation reestablishment is relatively slow. Desert vegetation may take 5 to 10 years to reestablish to a suitable density. Short-term losses in habitat would occur within 0.19 acre of temporary use areas (0.01 acre at Hidden Valley and 0.18 acre at the Narrows) in wetland and riparian areas which should recover quickly; resprouting would likely occur in the following year. Losses in habitat within the Narrows would have a greater impact than losses in habitat at Hidden Valley. The complexity and density of vegetation at the Narrows provides habitat with greater value to migratory bird species.

Other potential adverse impacts to migratory birds from the Proposed Action include project-related noise, human presence, and vehicle movement, resulting in migratory birds' abandoning the project area. These impacts would be short-term and limited to the construction phase of the project. It is anticipated that migratory birds would quickly resume using the area following the completion of construction.

Overall, impacts to migratory birds are anticipated to be negligible. Migratory birds are highly mobile and are able to quickly relocate to other suitable habitat, which is abundant in the areas adjacent to the project area. Additionally, environmental protection measures (Section 2.1.2) and mitigation measures (Section 4.5.3) would be implemented in order to further reduce impacts to migratory birds.

#### **FISH**

The Proposed Action would adversely impact fish habitat during the construction phase of the project. The channel would be diverted to allow for construction of the fish barriers which would require substantial excavation. Construction work may also lead to erosion and sediment movement immediately downstream of the fish barrier. Habitat lost from the footprint of the fish barriers would be negligible.

Once completed, the fish barrier may potentially affect downstream fish habitat through alteration of natural flow regimes and flooding events. These processes influence the redistribution of bed load in the river system and other variables of fish habitat. However, the fish barriers are designed to allow natural flow regimes and sediment transport once the subsequent impoundment deposition reaches the barrier height, although this may take up to 2 years. Therefore, it is anticipated that these effects would not be permanent and that regular flows and sediment transport would resume once deposition on the upstream side of the barrier becomes level with the barrier height. [AMH6]

The proposed fish barriers would result in reduced stream connectivity, leading to fragmentation of fish habitat within the project area. Habitat connectivity would be restored once the barriers are removed. Impoundments created by the barriers would slow riffles and areas of rapid flow, and would increase pooling and river depth. Impacts to fish habitat are anticipated to be minor as water levels would not rise above the existing OHWM, and these impacts would be restricted to a small area relative to the overall fish habitat provided within the Muddy River. The fish barriers themselves would provide an overall long-term net benefit to native fish populations. Exclusion of non-native species would be accomplished through preventing upstream migration of non-native fishes, eliminating competition, and reducing predation pressures from non-native fish. Overall, impacts to fish from construction of the fish barriers are anticipated to be temporary and would be mitigated through measures identified in Section 2.1.2.

The fish barriers themselves would provide an overall long-term net benefit to native fish populations. Exclusion of non-native species would be accomplished through preventing upstream migration of non-native fishes, eliminating competition, and reducing predation pressures from non-native fish. The barriers would also facilitate the eradication of non-native fish in the reaches between barriers.

Non-native fish removal using rotenone would affect fish species within the project area. Native fish that are salvaged prior to treatment may experience handling-related stress, resulting in short-term minor impacts. These impacts would be minimized by adherence to NDOW fish survey handling protocols. It is anticipated that a small number of native fish would not be captured and would experience mortality as a result of rotenone treatment.

If the treatment is successful, non-native fish would be removed from the reach and native fish would repopulate the reach from upstream areas, and populations would increase due to the absence of competition from non-native fish. As a result, although there would be short-term adverse impacts to native fish species, the overall impacts of the project would be beneficial. Once treatment is complete and monitoring reveals successful eradication of non-native fish and recovery of native fish, barriers upstream of the Narrows would have their cores removed in order to restore genetic connectivity to native fish populations. This would result in a long-term beneficial impact to native fish species.

#### **THREATENED AND ENDANGERED SPECIES**

##### **Moapa Dace**

Because suitable habitat for Moapa dace does not exist within the project area, no adverse impacts to Moapa dace are anticipated to result from the Proposed Action. However, implementation of the Proposed Action would have direct, long-term beneficial impacts to populations of Moapa dace. The proposed fish barriers will assist in the recovery efforts of this endangered fish by preventing upstream migration of introduced fishes that prey upon, and compete with, the Moapa dace (USFWS 1995).

##### **Mojave Desert Tortoise**

No suitable desert tortoise habitat occurs within the project area. As a result, the Proposed Action would not result in impacts to Mojave Desert tortoise. No new surface or vegetation disturbance would occur in desert tortoise habitat and all vehicles would remain within existing roadways and turnouts to access the project area. No impacts to desert tortoise or their habitat are expected to occur.

##### **Southwestern Willow Flycatcher**

Based on a review of the available data and a site reconnaissance visit in 2012, neither fish barrier site appears to contain habitat at this time to support the southwestern willow flycatcher. Therefore, construction of the fish barrier would not impact the southwestern willow flycatcher.

#### **Yuma Clapper Rail**

No suitable habitat for Yuma Clapper rail was identified within the project area. As a result, the Proposed Action is not anticipated to have any adverse impacts to the Yuma clapper rail.

#### **SPECIAL STATUS SPECIES**

##### **Moapa Speckled Dace and Virgin River Chub**

Moapa speckled dace and Virgin River chub share similar ecological characteristics within the project area; therefore, project-related impacts to these species were considered jointly for this analysis. Potential adverse impacts to Moapa speckled dace and Virgin River chub may result from the Proposed Action, and include those impacts discussed for general fish species in Section 4.5.1.3. Construction of the fish barrier could lead to harm or loss of individuals as a result of crushing by construction equipment. The proposed fish barriers would result in reduced stream connectivity, leading to fragmentation of Moapa speckled dace and Virgin River chub habitat within the project area. Construction activities would result in short-term adverse impacts to Moapa speckled dace and Virgin River chub by removing 0.06 acre of suitable habitat (0.03 acre at Hidden Valley and 0.03 acre at the Narrows). In addition, construction activities would reduce water quality in the project area. These impacts to Moapa speckled dace and Virgin River chub would be temporary and reduced through environmental protection measures included in the Proposed Action. Operation of the fish barriers and placement of riprap would remove a total of 0.08 acre (0.04 acre at each site) of Moapa speckled dace and Virgin River chub habitat, resulting in long-term, adverse impacts. However, relative to the acreage of available habitat within the project area, these impacts are considered to be negligible.

Implementation of the Proposed Action would have long-term beneficial impacts to populations of Moapa speckled dace and Virgin River chub. The Proposed Action will assist in the recovery efforts of these fish species by eradicating non-native fish upstream of the barriers and preventing the upstream migration of non-native fishes that prey upon, and compete with, the Moapa speckled dace and Virgin River chub (USFWS 1995). The future removal of the cores from the fish barriers upstream of the Narrows would result in increased genetic connectivity for Moapa speckled dace and Virgin River chub populations.

Direct effects of non-native fish treatment and upstream barrier removal would be the same as the effects to general fish species described in Section 4.5.1.3. However, owing to the apparent scarcity of both species in the Muddy River, the adverse impacts to both species would be of a lower magnitude than for more common species. Also, as speckled dace are smaller and have shorter generation times, they would likely begin to recolonize the treated reach immediately after treatment. As a result, treatment would likely have a major beneficial impact to this species.

##### **Banded Gila Monster**

Although suitable habitat for the banded Gila monster was identified in the proposed project area, no individuals were observed during the site reconnaissance. Potential adverse impacts may occur to the banded Gila monster under the Proposed Action and would include those impacts discussed for general wildlife in Section 4.5.1.1. The Proposed Action would result in short-term, adverse impacts to 0.45 acre (0.33 acre at Hidden Valley and 0.12 acres at the Narrows) of suitable Gila monster habitat during construction activities. These impacts would be temporary and reduced through environmental protection measures identified in the Proposed Action.

##### **Phainopepla**

Potential adverse impacts may occur to the phainopepla under the Proposed Action and would include those impacts discussed for migratory birds in Section 4.5.1.2. Although suitable habitat for the

phainopepla was identified in the proposed project area, no individuals were observed during the site reconnaissance. Higher densities of mesquite at the Narrows fish barrier site likely provide higher quality phainopepla nesting and foraging habitat relative to the Hidden Valley site. The Proposed Action would result in adverse, short-term impacts to 0.45 acre (0.33 acre at Hidden Valley and 0.12 acre at the Narrows) of suitable phainopepla habitat during construction activities. These impacts would be temporary and reduced through restoration activities and other environmental protection measures identified in the Proposed Action (see Section 2.1.2).

#### **4.5.2 No Action Alternative**

With the selection of the No Action Alternative, there would be adverse impacts to Muddy River native fish populations, particularly the Moapa dace. Without implementation of actions to prevent the upstream migration of non-native fishes, competition and predation pressures would continue to threaten populations of native fish.

Under the No Action Alternative, there would be no project-related impacts to wildlife, sensitive species, or migratory bird species. General wildlife and special status species that use the area as habitat for nesting, breeding, and/or foraging would continue to be subject to current local conditions and regional trends, which would include (but not be limited to) occasional use by recreationists.

#### **4.5.3 Mitigation**

Environmental protection measures listed in Section 2.1.4 adequately minimize impacts; therefore, no mitigation measures are needed.

### **4.6 Wild and Scenic Rivers**

#### **4.6.1 Proposed Action**

Under the Proposed Action, the Muddy River's eligibility as a National Wild and Scenic River could potentially be impacted by the construction of the fish barriers. As of now the Muddy River is tentatively eligible for the National Wild and Scenic Rivers System. The construction of the fish barriers would not automatically change the eligibility of this river segment. The construction of the fish barriers would cause impoundment both upstream and downstream; however, this would not change water levels so significantly as to affect the Muddy River's eligibility (Interagency Wild and Scenic Rivers Coordinating Council 2006). The proposed fish barrier design would continue to allow the river to flow freely.

The fish barrier is being implemented for the conservation of the ORV of fish and wildlife. The barriers could actually strengthen the Muddy River's eligibility status by reducing invasive fish species, increasing native fish populations, and improving fish habitats.

#### **4.6.2 No Action Alternative**

Under the No Action Alternative, the proposed fish barriers would not be constructed and the native fish species would continue to be affected by invasive species. The Muddy River would continue to experience present local conditions and be subject to current regional trends.

#### **4.6.3 Mitigation**

Environmental protection measures listed in Section 2.1.2 adequately minimize impacts; therefore, no mitigation measures are needed.



## 5.0 CUMULATIVE EFFECTS

Cumulative effects are the total effect, including direct and indirect effects, on a given resource resulting from the incremental impact of past, present, and reasonably foreseeable future actions. They can result from individually minor but collectively significant actions taken over a period of time. Cumulative effects may arise from single or multiple actions, and the effects may be additive or interactive. The net adverse effect of interactive actions may be less than the sum of the individual effects (countervailing), or the actions may interact to create a net adverse cumulative effect that is greater than the sum of the individual effects (synergistic) (Council on Environmental Quality 1997). The magnitude and extent of the effect on a resource depends on whether the cumulative effects exceed the ability of a resource to function at a desired level.

### 5.1 Cumulative Effects Analysis Area

The Cumulative Effects Analysis Area (CEAA) is defined as the upper Muddy River in the Moapa Valley. The Moapa Valley is about 40 miles long, running roughly northwest to southeast, and contains the Moapa Valley National Wildlife Refuge and the Warm Springs Natural Area. The upper floodplain of the Muddy River is located approximately 60 miles northeast of Las Vegas in the unincorporated towns of Moapa and Glendale in Clark County, Nevada, and upstream of the Interstate 15 Bridge for approximately 14 miles. This CEAA was chosen because it is home to the native species of fish for which the fish barriers are being constructed, and impacts along this stretch of river could add to the cumulative impact to these species and other related resources.

Land ownership in the upper Muddy River floodplain is primarily private, in a mix of agricultural, industrial, and residential uses. Nevada Power Company owns and manages 312 acres of floodplain and 1.2 river miles associated with the Reid Gardner Generating Plant. The Moapa Band of Paiutes manages 590 acres of floodplain along with 2.4 miles of the river within the Moapa River Indian Reservation. The BLM manages approximately 250 acres of floodplain, 1.8 river miles, and most of the uplands surrounding the upper Muddy River floodplain. In addition, The Nature Conservancy holds 59 acres of floodplain and 0.5 mile of river frontage adjacent to the BLM floodplain holdings (Provencher et al. 2005).

In the headwaters of the Muddy River, the USFWS manages the Moapa Valley National Wildlife Refuge, established in 1979 for the conservation of the Moapa dace and other species and habitats of concern. The Refuge is managed as part of the Desert National Wildlife Refuge Complex. The USFWS also developed the *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem* (USFWS 1995) to guide conservation actions for the aquatic species and habitats of concern in the river system. The Muddy River Recovery Implementation Team was formed to coordinate implementation of the recovery plan among resource management agencies and other stakeholders.

### 5.2 Past, Present, and Reasonable Foreseeable Future Actions

Future actions likely to occur within the CEAA (consistent with the Muddy River Recovery Implementation Program and the USFWS *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem*) include restoration of riparian and upland habitat, bank and channel stabilization activities, and invasive species control and treatment.

In 2001, the saltcedar leaf beetle (*Diorhabda elongata*) was introduced into Nevada and central Utah for saltcedar biocontrol. Beetles were moved by managers to St. George, Utah, in 2006 and then dispersed along the Virgin River and the Muddy River in 2010. These actions, combined with saltcedar removal and restoration, would result in an incremental improvement in riparian habitat along Muddy River within the

CEAA. The full extent of beneficial cumulative effects on riparian habitat is difficult to quantify at this time without long-term vegetation and wildlife monitoring.

Other reasonably foreseeable future actions include continued recreational use (e.g., camping, picnicking, etc.), agricultural use on private land adjacent to the Muddy River, and the ongoing evaluation of the Muddy River for Wild and Scenic River designation.

When combined with the level of past, present, and reasonably foreseeable actions, the impacts of the Proposed Action would not be of a magnitude sufficient to result in cumulative impacts to most resources, with the exception of fish habitat and riparian habitat, where beneficial impacts would occur.

## 6.0 LIST OF PREPARERS/REVIEWERS

Name	Title	Affiliation	Responsibility
<b>Data Providers and Reviewers</b>			
Mark Slaughter	Wildlife Biologist	BLM	Project Lead
Scott Winterton	Engineer	Bureau of Reclamation	Project Lead
<b>Preparers</b>			
Eric Koster	Project Manager	SWCA	Project management; document production and review
Steve Leslie	NEPA Specialist	SWCA	Document production and review
Matthew Villaneva	Botanist	SWCA	Wetland delineation; document production and review; vegetation; geology; wildlife
Lesley Hanson	Biologist	SWCA	Wetland delineation; document production and review
Mike Swink	Biologist	SWCA	Document production and review; hydrology; floodplains; threatened and endangered species
Bruce Schneider	GIS Analyst	SWCA	GIS analysis; map production
Adrian Hogel	Environmental Planner	SWCA	Document production and review; Purpose and Need; Proposed Action

## 7.0 CONSULTATION AND COORDINATION

SWCA conducted a wetland delineation and completed a preliminary jurisdictional determination (PJD) for wetlands in the project area in July 2012. The purpose of the PJD was to identify and quantify waters in the survey area that potentially fall within the jurisdiction of the USACE, under Section 404 of the Clean Water Act. The BLM submitted the PJD to the USACE for review and approval on August 8, 2012. The PJD is currently in the USACE review process.

To comply with Section 7 of the Endangered Species Act, a habitat assessment for the southwestern willow flycatcher has been prepared to determine potential effects to listed species. Suitable habitat was not identified and the BLM prepared a notice to serve as the Section 7 determination for consultation with the USFWS. No additional consultation is required (Sec 7 Log # NV-052-12-108).

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